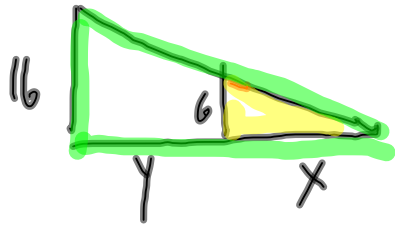


29.



$$\frac{dy}{dt} = -5 \frac{\text{ft}}{\text{sec}}$$

$$\begin{aligned} \frac{dx}{dt} &= \frac{6}{10} \left( -5 \frac{\text{ft}}{\text{sec}} \right) \\ &= -3 \text{ ft/sec} \end{aligned}$$

$$\frac{x}{6} = \frac{y+x}{16}$$

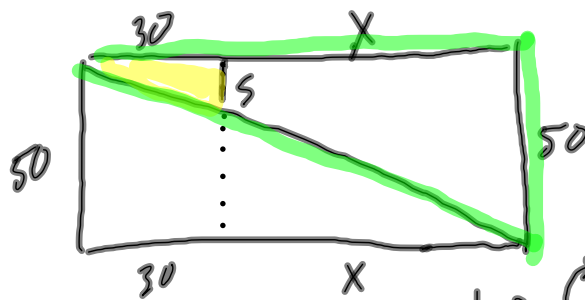
$$\frac{\frac{dx}{dt}}{6} = \frac{\frac{dy}{dt} + \frac{dx}{dt}}{16}$$

$$16 \frac{dx}{dt} = 6 \frac{dy}{dt} + 6 \frac{dx}{dt}$$

$$10 \frac{dx}{dt} = 6 \frac{dy}{dt}$$

Nov 4-8:59 AM

30



$$s = 16t^2$$

$$\frac{ds}{dt} = 32t \Big|_{t=\frac{1}{2}} = 16 \frac{\text{ft}}{\text{sec}}$$

$$s\left(\frac{1}{2}\right) = 16 \cdot \frac{1}{4} = 4$$

$$30 \cdot 4 + 4X = 1500$$

$$X = \frac{1500 - 120}{4} = 345$$

der.

$$\frac{30 \cdot X}{50} \neq \frac{30}{5}$$

$$30s + Xs = 1500$$

$$30 \frac{ds}{dt} + X \frac{ds}{dt} + s \frac{dX}{dt} = 0$$

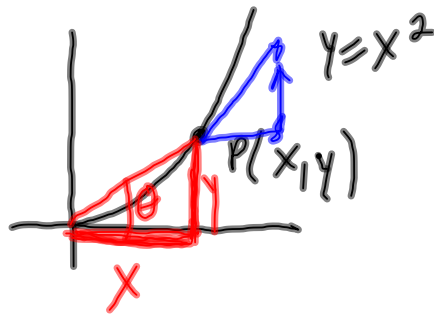
$$30 \cdot 16 + 345 \cdot 16 + 4 \frac{dX}{dt} = 0$$

$$\frac{dX}{dt} = \frac{-30 \cdot 16 - 345 \cdot 16}{4}$$

$$= -1500 \frac{\text{ft}}{\text{sec}}$$

Nov 4-9:24 AM

25.



$$\frac{dx}{dt} = 10 \frac{m}{s}$$

horiz speed

$$\tan \theta = \frac{y}{x} = \frac{x^2}{x} = x$$

$$\tan \theta = x$$

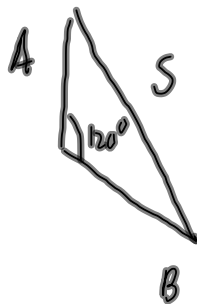
$$\left| \frac{\sqrt{10}}{1} \right|$$

$$\sec^2 \theta \frac{d\theta}{dt} = \frac{dx}{dt} \cos^2 \theta = 10 \left( \frac{1}{\sqrt{10}} \right)^2 = 1 \frac{rad}{sec}$$

$$3 = \tan \theta$$

Nov 4-9:35 AM

35.



$$s^2 = A^2 + B^2 - 2AB \cos 120^\circ$$

$$s^2 = A^2 + B^2 + AB$$

$$\frac{dA}{dt} = 14$$

$$\frac{dB}{dt} = 21$$

$$A = 5$$

$$B = 3$$

$$s = \sqrt{5^2 + 3^2 + 5 \cdot 3}$$

$$= \sqrt{49} = 7$$

$$2s \frac{ds}{dt} = 2A \frac{dA}{dt} + 2B \frac{dB}{dt} + A \frac{dB}{dt} + B \frac{dA}{dt}$$

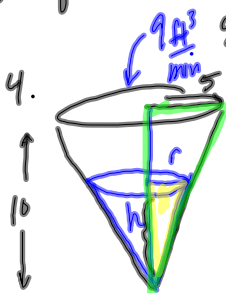
$$\frac{ds}{dt} = \frac{2 \cdot 5 \cdot 14 + 2 \cdot 3 \cdot 21 + 5 \cdot 21 + 3 \cdot 14}{2 \cdot 7}$$

$$= 29.5 \text{ knots}$$

Nov 4-9:50 AM

4.6 again - that's right, again until we get it right

EX 4.



$V = \text{volume}$   $\frac{dV}{dt} = 9 \text{ ft}^3/\text{min}$

$h = \text{height of water (depth)}$

find  $\frac{dh}{dt}$  (how fast water rises)

$$V = \frac{1}{3} \pi r^2 h$$

$$\frac{5}{10} = \frac{r}{h}$$

when  $h = 6$

$$r = \frac{h}{2}$$

$$V = \frac{\pi}{3} \left(\frac{h}{2}\right)^2 h$$

$$\frac{dV}{dt} = \frac{\pi}{12} 3h^2 \frac{dh}{dt}$$

$$V = \frac{\pi}{12} h^3$$

$$9 = \frac{\pi}{12} 3 \cdot 6^2 \frac{dh}{dt}$$

$$\frac{9 \cdot 12}{\pi \cdot 3 \cdot 6^2} = \frac{dh}{dt}$$

$$\frac{1}{\pi} \frac{\text{ft}}{\text{min}} = \frac{dh}{dt}$$

Nov 4-9:58 AM